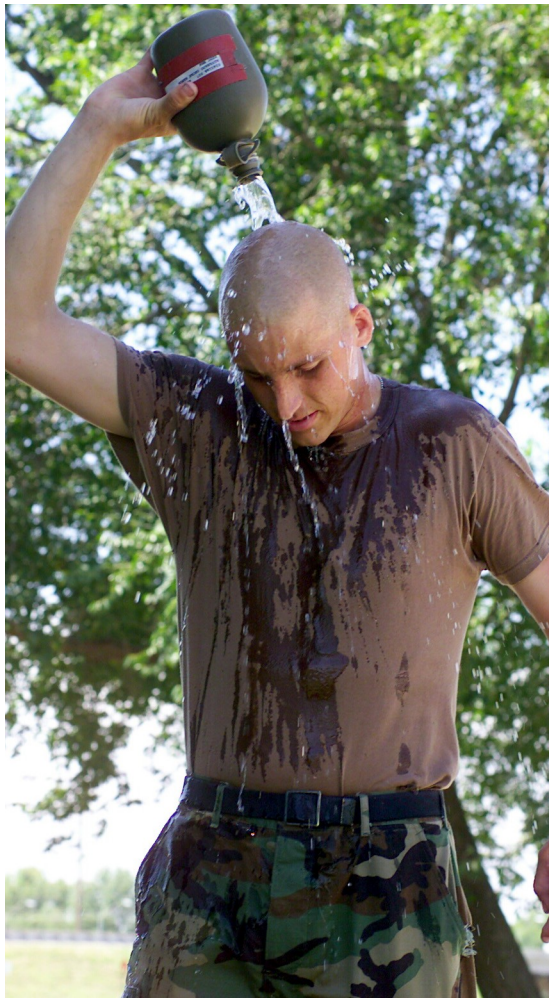
TRADOC Leaders and Heat Injury Prevention

See TR 350-6, 30 DEC 2005, Appendices J-K

Workload + Hot Weather
Can = Heat Injury

Heat Injuries



- **Heat Injuries are a major threat in both training and combat. They kill or disable Soldiers every year.**

- **Why? The human body is a small radiator that is easily overloaded by:**

  Exercise/work (15 times more heat is produced).
  hot/humid weather
  too little fluids
  too few electrolytes (salts or minerals)
  this can be caused by too much water

- **Heat injuries kill or disable by "cooking" internal organs.**

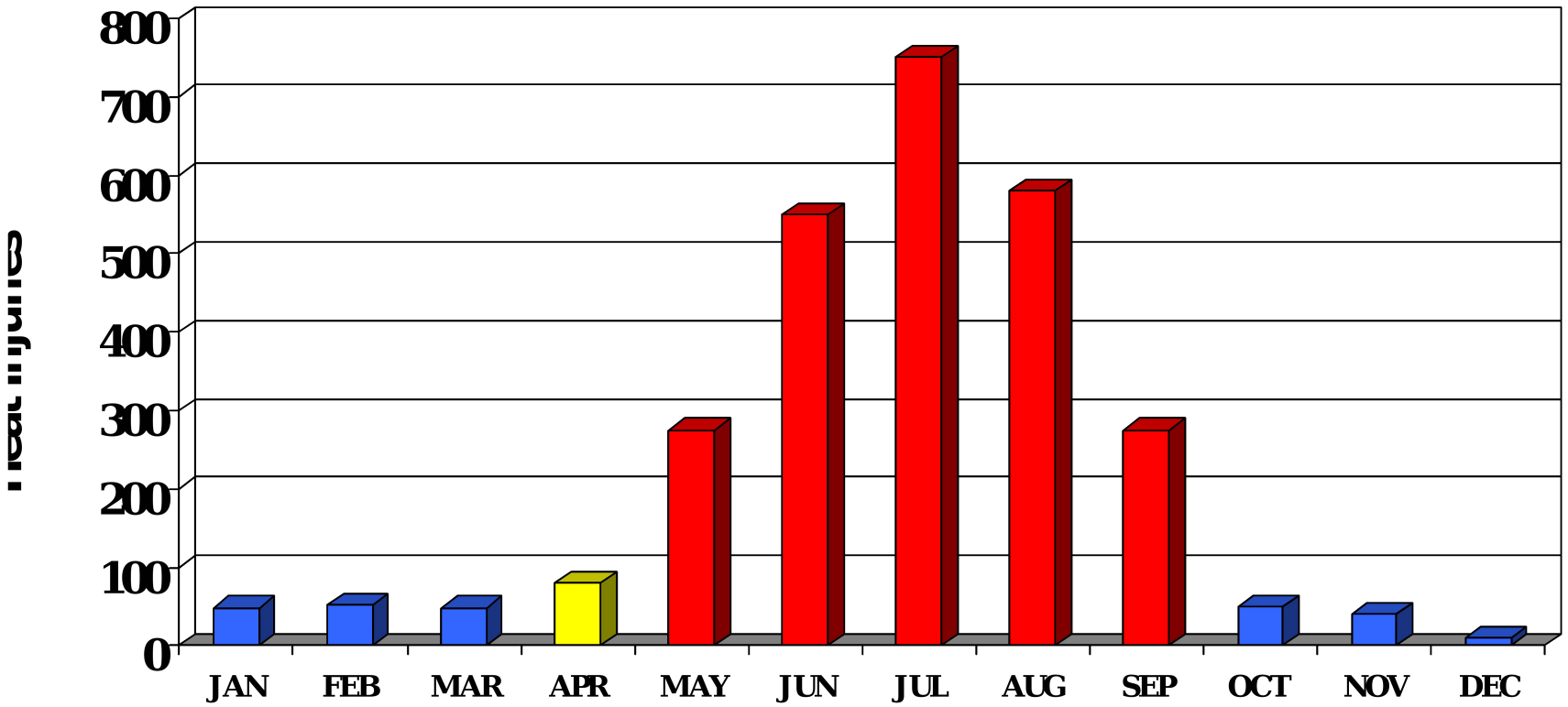
- **Human organs cannot be trained to tolerate heat (i.e. to not get cooked). When it occurs, organ damage is permanent; it cannot be overcome by willpower or motivation.**

- **The best solution is prevention!**

Heat Injury Risk Management

1. Identify Hazards
2. Assess Hazards
3. Develop Controls
4. Implement Controls
5. Supervise-Evaluate

. Identify Hazards: Highest Risk Months



- **Greatest risk factor is a high Heat Category.**
- **Risk starts at 75 degrees Fahrenheit**
- **Most heat injuries occur between April and September**

Data Source: Army Medical Surveillance Activity (AMSA) from Defense Medical Surveillance System (vol. 07/No. 03)

1. Identify Hazards: Time In Service

Soldiers in their first 18-24 months of active duty have significantly higher rates of heat injuries.

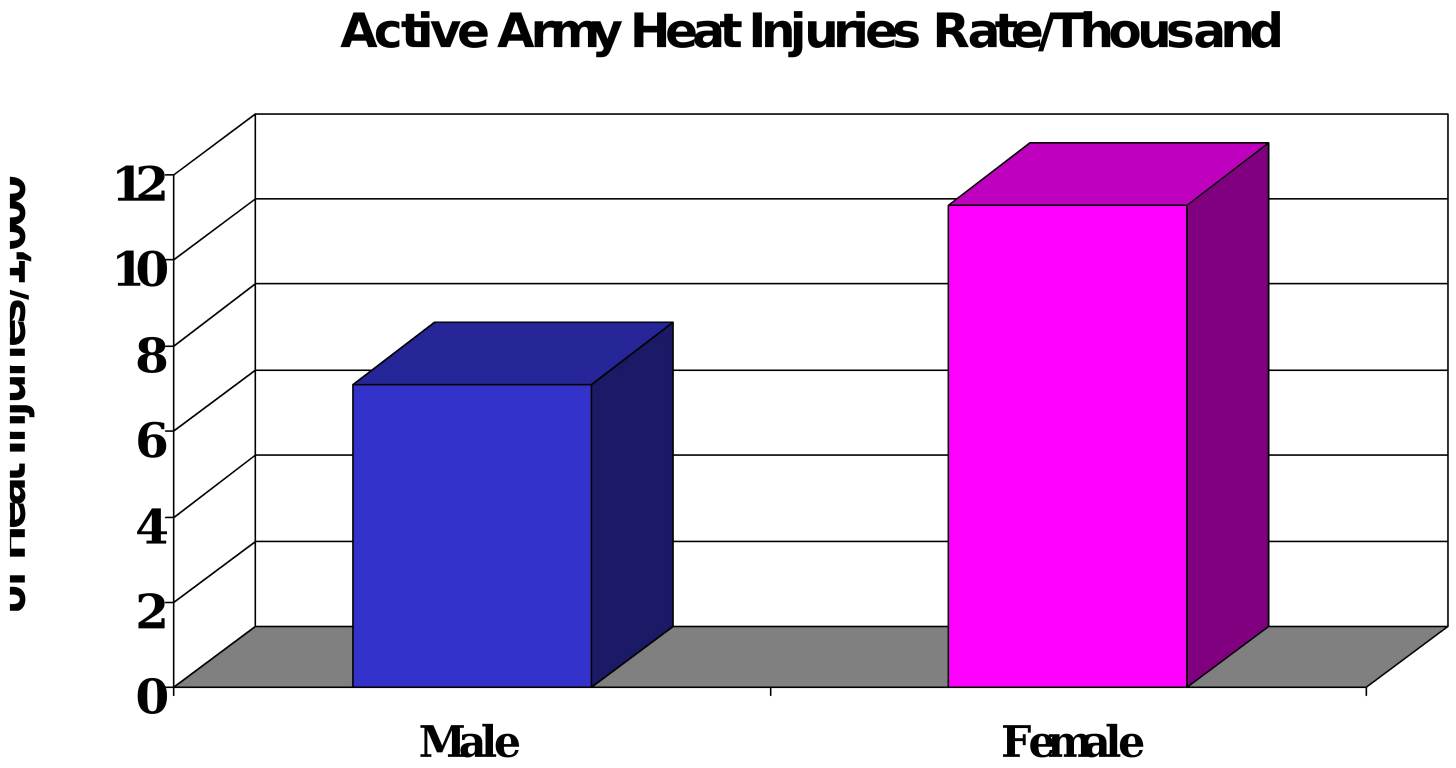
Data Source: Army Medical Surveillance Activity (AMSA) from Defense Medical Surveillance System (vol. 07/No. 03

1. Identify Hazards: Time In Training

- **30 Department of Defense recruits died between 1977-2001**
- **First 2-3 weeks of BCT/OSUT are a high risk period (acclimatization is incomplete)**
- **FTXs and 10-15k marches are potentially very high risk during summer months**

1. Identify Hazards:

Gender



- **Young women (<20 y/o) have higher rates of heat injuries than young men.**

Identify Hazards: Soldier Risk Factors

- Sickle Cell Trait (SCT) – 40x higher risk for Heat Injury*
- Non-acclimatized or recently hospitalized
- Poor physical fitness
- Overweight
- Sick (colds, flu, diarrhea, etc.)
- Taking drugs (they interfere with body pro
  - Antihistamines (Benadryl®, Atarax®, etc
  - Decongestants (Sudafed®)
  - High Blood Pressure (diuretics, beta blockers)
  - Psychiatric Drugs (tricyclic antidepressants, antipsychotics)

* The Army currently does not test for SCT

. Identify Hazards: Soldier Risk Factors

- **Prior heat injury_**
- **Donating blood (losing Red Blood Cells hurts heat adaptation)**
- **Skin damage (sunburn, rash, poison ivy)**
- **“Overly motivated”**
- **Nutritional supplements (Ephedra, Cr**
- **Alcohol (alcohol dehydrates)**
- **RECBN: Soldiers with a history of recent, rapid weight loss due to extr measures (laxatives, vomiting, sweat boxes, food-water deprivation**

2. Assess Hazards: Continuous heat exposure

- **Leaders should assess the impact of 2 previous days of continuous heat exposure:**

- **H- Heat category past 2 days**
- **E- Exertion level past 2 days**
- **A- Acclimatization/ individual risk factors**
- **T- Temperature/rest overnight**

- **Cluster of heat injuries on prior 2 days = HIGH RISK**

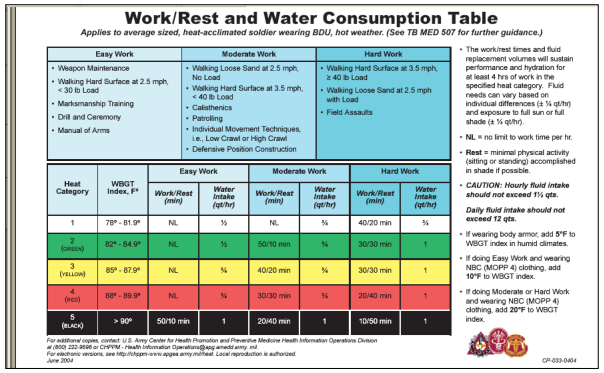
NOTE: Approx. 40% of heat injuries may occur under green flag conditions. This is probably due to previous days'

Heat Injury Risk Management Matrix (FEB 06)

Risk Factors	Risk Level Circle the appropriate condition for each factor			
	0 points/circle Low Risk	**1 point/circle Medium Risk**	**2 points/circle High Risk**	**3 points/circle Extreme Risk**
Risk Management Worksheet	All controls implemented			Not all controls implemented
WBGT at site NOTE: Add 5 F. for backpack or body armor	< Cat 1	Cat 1	Cat 2-3	Cat 4-5
Back-to-back Cat 5 days	0	1	2-3	>4
Heat Injuries in past 2 days	0	Heat Cramps	Heat Exhaustion	Heat Stroke/ Death
Workload in past 2 days (see TR 350-29 workload classification chart)	Easy	Easy or Moderate	Moderate or Hard	Hard
Projected workload	Easy	Easy or Moderate	Moderate or Hard	Hard
Heat acclimatization days	>13	7-13	3-6	<3
Leader/NCO presence	Full Time	Substantial	Minimal	None
Cadre duty experience	18 months	7-18 months	1-6 months	<1 month
Communication System (tested at training site)	Radio and landline phone	Landline phone only	Radio only	None
Previous 24 hours sleep	>7 hours	5-7 hours	2-4 hours	<2 hours
Food/salty snacks every 4 hours	<4 hours	4-6 hours	6-7 hours	>7 hours
Onsite 91W/CLS and iced sheets (min. 8 single bed sheets/company in cooler)	Both iced sheets & Medic, EMT, or CLS	Only Iced sheets	Medic, EMT, or CLS	None
Add Circled Blocks with points/circle				

Total Score: 0-7 = Low Risk; 7-15 = Medium Risk; 16-24 = High Risk; 25-39 = Extreme Risk

3. Develop Controls: Prepar



Work/Rest and Water Consumption Table

Applies to average sized, heat-acclimated soldier wearing BDU, hot weather. (See TB MED 507 for further guidance.)

Easy Work	Moderate Work	Hard Work
• Weapon Maintenance • Walking Hard Surface at 2.5 mph, < 30 lb Load • Marksmanship Training • Drill and Ceremony • Manual of Arms	• Walking Loose Sand at 2.5 mph, No Load • Walking Hard Surface at 3.5 mph, < 40 lb Load • Calisthenics • Patrolling • Individual Movement Techniques, i.e., Low Crawl or High Crawl • Defensive Position Construction	• Walking Hard Surface at 3.5 mph, ≥ 40 lb Load • Walking Loose Sand at 2.5 mph with Load • Field Assaults

Heat Category	WBGT Index, F°	Easy Work		Moderate Work		Hard Work	
		Work/Rest (min)	*Water Intake (qt/hr)*	*Work/Rest (min)*	*Water Intake (qt/hr)*	*Work/Rest (min)*	*Water Intake (qt/hr)*
1	78° - 81.9°	NL	½	NL	¾	40/20 min	¾
2 (GREEN)	82° - 84.9°	NL	½	50/10 min	¾	30/30 min	1
3 (YELLOW)	85° - 87.9°	NL	¾	40/20 min	¾	30/30 min	1
4 (RED)	88° - 89.9°	NL	¾	30/30 min	¾	20/40 min	1
5 (BLACK)	> 90°	50/10 min	1	20/40 min	1	10/50 min	1

- The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hrs of work in the specified heat category. Fluid needs can vary based on individual differences (± ¼ qt/hr) and exposure to full sun or full shade (± ¼ qt/hr).
- **NL** = no limit to work time per hr.
- **Rest** = minimal physical activity (sitting or standing) accomplished in shade if possible.
- ***CAUTION: Hourly fluid intake should not exceed 1½ qts.***

  Daily fluid intake should not exceed 12 qts.
- If wearing body armor, add **5°F** to WBGT index in humid climates.
- If doing Easy Work and wearing NBC (MOPP 4) clothing, add **10°F** to WBGT index.
- If doing Moderate or Hard Work and wearing NBC (MOPP 4) clothing, add **20°F** to WBGT index.

For additional copies, contact: U.S. Army Center for Health Promotion and Preventive Medicine Health Information Operations Division at (800) 222-9698 or CHPPM - Health Information Operations@apg.amedd.army. mil.
For electronic versions, see http://chppm-www.apgea.army.mil/heat. Local reproduction is authorized.
June 2004

CP-033-0404

- **Establish SOPs and signals**
- **Train and test all personnel**
- **Issue Heat Injury cards to all cadre**
- **Place Heat Injury posters in bathrooms, bulletin boards, DFAC, and training areas**
- **Identify “at risk” Soldiers**
- **Issue and use Ogden Cords (knotted cord on BDU lapel or under ACU name tape):**
  - **Use red or yellow cord for “at-risk” Soldiers**
  - **Use to monitor daily hydration (1 knot per canteen)**
- **Ensure one functional WBGT device for each training site.**

3. Develop Controls: Planning

- **Revise training 1 day prior, considering:**
  - **Previous 2 days of heat exposure**
  - **Predicted Heat Category**
  - **Training events (distance, pace, breaks, etc.)**
  - **Uniform/equipment**
  - **Location**
  - **Time of day**
  - **Work-rest cycle, hydration guidelines, etc.**

- **Plan communication capabilities, water, food/snacks, medical, and evacuation support.**
  - **Recommend commercial electrolyte beverages in high-risk months (or when daily water consumption exceeds 1-1.5 gallons/day)**
  - **Recommend commercial electrolyte beverages be diluted to half-strength, if used**
  - **Ensure canteens/hydration packs are**

3. Develop Controls: Risk Reducing Measures

Work/Rest and Water Consumption Table

Applies to average sized, heat-acclimated soldier wearing BDU, hot weather. (See TB MED 507 for further guidance.)

Easy Work	Moderate Work	Hard Work
• Weapon Maintenance • Walking Hard Surface at 2.5 mph, < 30 lb Load • Marksmanship Training • Drill and Ceremony • Manual of Arms	• Walking Loose Sand at 2.5 mph, No Load • Walking Hard Surface at 3.5 mph, < 40 lb Load • Calisthenics • Patrolling • Individual Movement Techniques, i.e., Low Crawl or High Crawl • Defensive Position Construction	• Walking Hard Surface at 3.5 mph, ≥ 40 lb Load • Walking Loose Sand at 2.5 mph with Load • Field Assaults

Heat Category	WBGT Index, F°	Easy Work		Moderate Work		Hard Work	
		Work/Rest (min)	*Water Intake (qt/hr)*	*Work/Rest (min)*	*Water Intake (qt/hr)*	*Work/Rest (min)*	*Water Intake (qt/hr)*
1	78° - 81.9°	NL	½	NL	¾	40/20 min	¾
2 (GREEN)	82° - 84.9°	NL	½	50/10 min	¾	30/30 min	1
3 (YELLOW)	85° - 87.9°	NL	¾	40/20 min	¾	30/30 min	1
4 (RED)	88° - 89.9°	NL	¾	30/30 min	¾	20/40 min	1
5 (BLACK)	> 90°	50/10 min	1	20/40 min	1	10/50 min	1

For additional copies, contact: U.S. Army Center for Health Promotion and Preventive Medicine Health Information Operations Division at (800) 222-9698 or CHPPM - Health Information Operations@apg.amedd.army. mil.
For electronic versions, see http://chppm-www.apgea.army.mil/heat. Local reproduction is authorized.
June 2004

- The work/rest times and fluid replacement volumes will sustain performance and hydration for at least 4 hrs of work in the specified heat category. Fluid needs can vary based on individual differences (± ¼ qt/hr) and exposure to full sun or full shade (± ¼ qt/hr).
- **NL** = no limit to work time per hr.
- **Rest** = minimal physical activity (sitting or standing) accomplished in shade if possible.
- ***CAUTION: Hourly fluid intake should not exceed 1½ qts.***

  Daily fluid intake should not exceed 12 qts.
- If wearing body armor, add **5°F** to WBGT index in humid climates.
- If doing Easy Work and wearing NBC (MOPP 4) clothing, add **10°F** to WBGT index.
- If doing Moderate or Hard Work and wearing NBC (MOPP 4) clothing, add **20°F** to WBGT index.

CP-033-0404

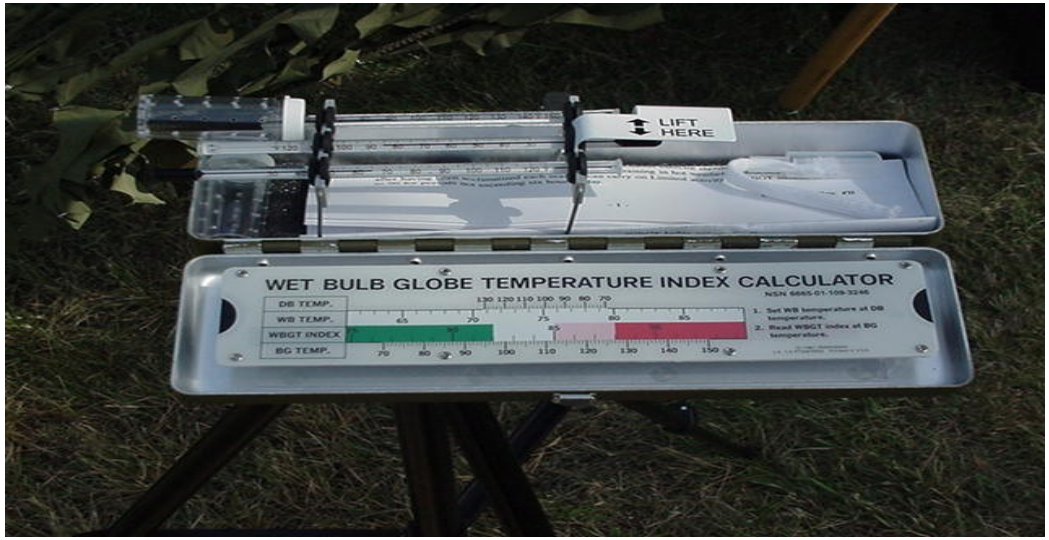
NOTE: All fluids provide water, whether milk, fruit juice, etc.

3. Develop Controls:
Adapt

- **Monitor WBGT hourly in the training area (not at one or two central areas). Roads or ranges can be far hotter than surrounding terrain.**

- **Adjust training as necessary based on the local WBGT to decrease the heat load.**

- **Power down: authorize the officer or Senior NCO on the ground to make risk reducing decisions.**



3. Develop Controls: Issues

"At Risk" Soldiers

- Positive for SCT
- Overweight or underfit
- Sick, previous heat injury, recently hospitalized, or skin damage (sunburn, rash),
- Donated blood (< 3 days)
- Taking certain drugs

Control:

- Ensure a low-risk person is charged with monitoring high risk Soldiers
- Have high risk Soldiers wear red or yellow Ogden Cord
- Require daily weights for Soldiers (standardize: same time each day after bathroom call and before shower while in underwear)
- Proper rehydration should restore previous day's weight; a weight loss of 1 lb or more in one day is almost always water

3. Develop Controls: Issues

Blood Donations:

- Loss of Red Blood Cells interferes with heat and exercise adaptation
- Takes 6 weeks to fully recover
- Blood donations in RECBN and first 3 weeks of BCT-OSUT are forbidden (TR 350-6)

Control:

- No strenuous physical activity for 24 hours after blood donation
- Rehydrate after donation with electrolyte beverage
- Use caution on troop movements to classes, DFAC, etc., due to the risk of "passing out"
- Avoid Heat Category 3-5 exposure, APFT, road marches, etc., for 3 days after donation

3. Develop Controls: Issues

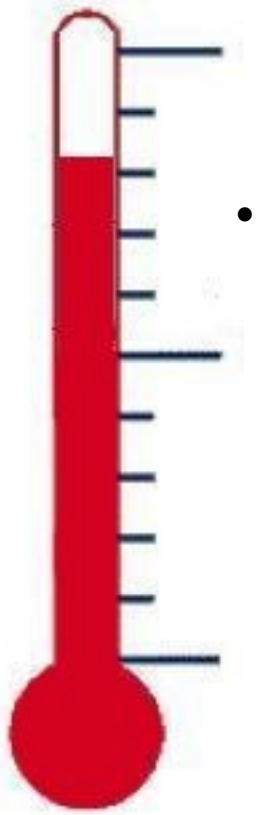
Drugs that Interfere with heat adaptation

- Antihistamines (Benadryl®, Atarax®, CTM®)
- Decongestants (Sudafed®)
- High Blood Pressure (diuretics, beta blockers)
- Psychiatric Drugs (tricyclic antidepressants, antipsychotics)

Control:

Ask medical treatment facility to annotate risk on medication bottles and issue profile as necessary.

4. Implement Controls: Minimizing Heat Load



- **Change Schedule (time of day and location):**

  Move training (workload) to cooler parts of day
  Move training to cooler locations (shade, covered bleachers, etc.).
  Avoid direct sun, if possible

- **Change clothing-equipment: CDR /Leader/ NCO may authorize:**

  NOTE: Add 5 degrees to WBGT for rucksack or body armor. Add 10 degrees to WBGT if in MOPP 4; Add 20 degrees if moderate to heavy work

  Heat Category 3:
  - **Unblouse BDU or ACU trousers; roll up to boot top**
  - **Unbuckle web belt**
  - **Remove Body Armor**

  Heat Category 4: All Heat Category 3 controls plus:
  - **Roll BDU or ACU sleeves up.**
  - **Remove t-shirt or remove BDU-ACU (remove t-shirt and wear BDU-ACU top if there is direct sun exposure or biting insects)**
  - **Replace helmet with soft cap unless helmet needed for safety**
  - **Decrease backpack load to <30 lbs**

4. Implement Controls: Minimizing Heat Load

- **Change events:**

- Avoid strenuous, back-to-back events
- Double space formations (60” between each Soldier)
- Shade Soldiers whenever possible

Overhead shelters in training areas

Field showers for cooling and personal hygiene

Cool showers at day’s end

Schedule high heat load events (like Victory Road Marches) so that they start and finish prior to the onset of Category 4 weather

Modify events in Category 4-5 weather:

> Increase breaks; Synchronize rest breaks for timed events

> Shorten distance/adjust pace

> Adjust uniform

> Decrease load (remove backpacks,

5. Supervise-Evaluate: Leader Prevention Actions

- **Spot check troops by:**

Confirm Buddy System is in place.

Monitor food intake (food/salty snack every 4 hrs or less).

Check Ogden cords for water intake. Are they drinking BEFORE PT in morning?

Monitor urine output. Soldiers should be urinating a full bladder every 2-3 hours.

Ask questions that require clear thinking (What day is it? Who is your DS? Where are you?).

Look for Soldiers who are visibly 'wilting' or struggling.

Be alert for Soldiers bypassing controls (e.g. not drinking in order to have a full canteen for an inspection).

Ensuring Soldiers weigh themselves daily – check the weight log and ensure it is occurring. Ask soldiers the significance of weight loss, and what they do to correct weight losses (see slide 16)

5. Supervise-Evaluate: Leader Prevention

- **Spot check cadre**

Are your Soldiers checking their weights every day? What are they doing about weight loss between days?

“What is the current Heat Category?”

“Who is at risk?” ”Who is their buddy?”

“What actions would you take if … ”

Is water available and accessible?

Are rapid cooling supplies on-hand?

5. Supervise-Evaluate: Leader Prevention Actions

- **Spot check medical support**
  - **Check equipment, personnel, evacuation vehicle, commo, rapid cooling supplies**
  - **If no organic medical support, check for coordination of alternatives (gate access for off-post EMS, travel time, procedures, etc.)**

Evaluate: Heat Injuries

RECOGNIZE HEAT INJURIES

- Weakness or inability to work
- Muscle cramps
- Dizziness
- Headache
- Clumsiness, unsteadiness, staggering gait
- Irritability (grouchy)
- Involuntary bowel movement

Heat Cramps-Exhaustion

- Convulsions and chills
- Vomiting
- Confusion, mumbling (Does not know Who, When, Where)
- Combative
- Passing out (unconscious)

Heat Stroke

Treat: Heat Cramps or Exhaustion

- **STOP**. Stop activity.
- **REST**. Rest Soldier flat with feet elevated on their helmet, sand bags, etc.
- **COOL**.

  Move Soldier to cool location (shade, A/C car, or building, etc.).

  Loosen uniform/ remove BDU or ACU blouse/ remove head gear.

  Have Medic, EMT, or CLS evaluate Soldier.

  > Excessive water intake, large clear urination, poor food intake, vomiting, and/or distended abdomen? Give salty snack if conscious. Do not give water or IV in this scenario.

  > Poor water intake, poor urination, etc. then have casualty sip cool electrolyte beverage as tolerated over twenty-thirty minutes. Do not force water.

  > Medic takes vital signs, symptoms, mental status, and notes training environment conditions.

  Evacuate if no improvement in 30 min, or if Soldier's condition worsens.

  When in doubt, **EVACUATE**.

  NOTE: The same person should observe the Soldier during treatment and evacuation in order to spot symptom changes.

- **Check other Soldiers**: reassess situation, and adjust training as

Treat: Heat Stroke

- **STOP**. Stop activity.
- **REST**. Put conscious Soldier flat with feet elevated on a helmet, sand bag, etc. If unconscious, roll on one side (helps prevent casualty from choking on vomit).
- **COOL**.

  Move to cool location (shade, etc.)

  Strip BDU or ACU and boots off to underwear (t-shirt/briefs).

  NOTE: Ensure a same gender helper is present, if possible.

  Immediately cool Soldier with iced sheets. Cover everything except the Soldier's face with the iced sheets. Ensure the iced sheet is soaked prior to applying to the casualty. Fan the entire body.

  Stop cooling if shivering occurs.

  CLS, EMT, or Medic evaluate casualty:

  > History of excessive water intake, large clear urination, poor food intake, vomiting, and/or distended abdomen? Give salty snack if conscious. Do not give water or IV.

  > Poor water intake, poor urination, etc., then have casualty sip cool electrolyte beverage as tolerated (if awake). Do not force water.

  > If evac delayed >10 min, CLS/91W give 500 cc Normal Saline IV.

- **CALL**. Call for evacuation. Continue cooling enroute.

Treat: Immediate, rapid cooling

Cooling is first priority- it can reduce death rate from 50% to 5%

- **Lay Soldier flat with feet elevated.**
- **Strip BDU or ACU off to underwear (t-shirt/briefs). Life is more important than modesty!**
- **Apply iced sheets. Cover top of head and body with iced sheets.**
- **Soak with water.**
- **Fan.**
- **Massage large muscles while cooling.**
- **When sheets warm up, apply fresh, cold sheets or put them back into cooler and then reapply.**
- **100% observation by the same Soldier.**
- **Stop cooling if shivering occurs or when rectal temp drops to 100 F. (Medic or EMT task)**
- **CLS, Medic, or EMT evaluate cas or IV.**
- **Evacuate. Continue cooling enr**

Iced Sheet Treatment

Stop cooling when casualty starts shivering or rectal temp is 100 F. (Medic or EMT task)

Basic load: 8 sheets/company in large cooler of ice water.

Soldier has suspected heat illness
(dizziness, headache, dry mouth, nausea, weakness, muscle cramps)
Are there?
Mental status changes?
OR
Vomits 2x or more?
OR
Unconsciousness > 1 minute?
OR
Rectal temperature >104º F (Medic or EMT task)?

NO

TREAT: Stop, Cool

- Loosen clothing
- Place Soldier in shade or cool area
- Provide fluids by mouth – 1 qt/30 Min min X 2
- Give salty snack

Soldier gets worse or does not improve in 30 minutes?

YES
Evacuate

NO

- **Limited indoor duty for remainder of day**
- **Medical evaluation within 24 hours**

YES

EVACUATE: Stop, Cool, Call

- **Place Soldier flat with legs elevated in cool area**
- **Strip clothing**
- **Apply iced sheets, soak, & fan Soldier**
- **Evaluate Soldier:**
  - **Too much water, urine output, vomiting? Give salty snack.**
  - **Poor water, urine output? Sip cool electrolyte drink. Never force water.**
- **IF evacuation delayed >10 min, only one 500 cc IV Normal Saline (IV preferably chilled in ice water).**
- **Stop cooling if shivering or rectal temp is 100 F. (Medic or EMT task)**
- **Reconfirm core temperature when evacuation arrives (EMT or Medic task)**

Field Expedient rapid cooling

- If no iced sheets are available, use any Field expedient rapid cooling option at hand:
  - Creek or stream
  - Hole filled with cool, cold, or ice water
  - Poncho-lined hole filled with cool, cold, or ice water
- MUST have 100% constant supervision with a Soldier-helper holding the casualty's head.
- Stop cooling when casualty starts shivering or rectal temp is 100 F (Medic or EMT task)

Heat Injury Evacuation criteria

- **Soldier treated with Iced Sheets due to presumed Heat Exhaustion or Heat Stroke**
- **Loss of consciousness or mental status changes**
- **Vomits more than once**
- **No improvement after 30 min of rest and hydration**
- **Gets worse during treatment**
- **Rectal temp >104 (Medic or EMT task)**

- **Evacuate any Soldier that requires cooling with iced sheets due to abnormal mental status**

Water Intoxication (Hyponatremia)

- **Frequently occurs in IET units, especially during BCT/OSUT**
- **Mental status changes**
- **Vomiting**
- **History of consumption of large volume of water**
- **Poor food intake**
- **Abdomen distended/bloated**
- **Large amounts of clear urine**

- **Do not give more water or IV! If awake, allow Soldier to consume salty foods or snacks**

Medical Support Issues

- **Some installations only have clinics instead of hospitals. Some have no Emergency Room.**
- **Some units have no organic ground ambulance support.**
- **What are alternatives?**

  Medical professionals train CLSs on heat injury evacuation decision guidance and iced sheet treatment.

  Carry iced sheets. Plan on 8 sheets per company in large ice water cooler.
  NOTE: Wash wet sheets and clean cooler daily

  Coordinate for non-military ambulance support (garrison or off-post).
  What support can they provide?
  What is their level of training?
  Do they have gate access?

  Coordinate unit transport as necessary.

  Conduct tests to ensure 100% communication (Cell phone dead

Summary: What Decreases Heat Injury Risk?

- **Moving work to cooler times/places (always drink BEFORE early am runs).**
- **Adjust work-rest cycles (TR 350-29).**
- **Drink cool water frequently (but no more than 1.5 qts/hr or 12 qts/day).**
- **Eat food (vegetables, fruits, salty snacks, electrolyte-carb-protein beverages or gels* (every 4 hrs or less).**
- **Consume sufficient electrolytes (salty snacks, salty soups, electrolyte beverages or gels*).**
- **Ensure cooling capabilities (showers, fans).**
- **Adjusting clothing-equipment. Allow senior Leader/NCO on the ground to make the call.**
- **Wear sunscreen lotion (SPF 50, sweatproof, with vitamins).**

mmary: What Increases the Risk for Heat Injuries?

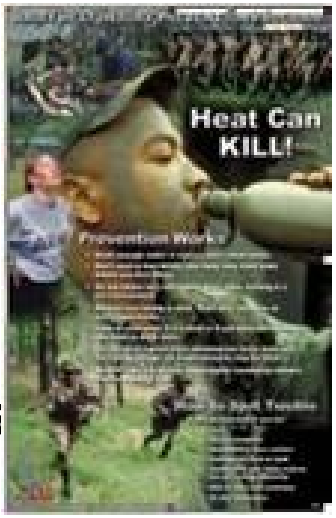
- **Pushing Soldiers who are showing heat symptoms.**
- **Requiring uniform and training change approval away from work site.**
- **Food deprivation.**
- **Not using previous 2 days of heat and workload to adjust training.**
- **Not reassessing unit & training when Heat Injuries occur.**
- **Not adjusting workload, rest breaks, uniform, and equipment to Heat Category.**
- **Not hydrating before early morning runs and throughout training day.**
- **Ineffective Attitudes/Myths:**

  "Breaking them in training prevents them from breaking in war."
  "Working harder in heat prepares them for the desert."

Reality:

Training IAW heat prevention doctrine prepares Soldiers for OIF and saves lives.

Do it right so Soldiers learn it right!



Heat Injury Prevention posters and ca

http://www.tradoc.army.mil/surgeon/inde

–

http://chppm-www.apgea.army.mil/heat/

Post posters in

- **barracks**
- **bathrooms**
- **DFACs**
- **Training areas**

Order Heat Injury Video from

s://safety.army.mil/pages/media/pubs/video/heatinjury

or Download
http://www.usaac.army.mil/drillsgt/HeatInjuriyVidClip.wmv

Questions?